NEW GEOGRAPHICAL AND MORPHOLOGICAL DATA FOR *SIDEROXYLON THORNEI* (SAPOTACEAE)

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ABSTRACT

Recent discoveries of new localities for this rare species justify documentation of its presently known range. The additional specimens show that leaves and fruits can be much larger than previously recorded. Foliar micromorphology as viewed by scanning electron microscopy demonstrates the species is distinctive and probably not derived from *S. lanuginosum* and *S. reclinatum* as formerly thought.

RESUMEN

El reciente descubrimiento de nuevas localidades de esta rara especie justifica la documentación de su rango conocido actualmente. Los especímenes adicionales muestran que las hojas y los frutos pueden ser mucho más grandes que los citados previamente. La micromorfología foliar al microscopio electrónico de barrido demuestra que esta especie es peculiar y que probablemente no es derivada de *S. lanuginosum* y *S. reclinatum* como se pensó previamente.

The buckthorns of the southeastern United States have long been known as species of *Bumelia*. Thorne's buckthorn or swamp buckthorn, *Bumelia thornei* Cronq., was described in 1949. It was identified as a species deserving Federal listing as an endangered species (Smithsonian Institution 1975) and has remained under consideration for listing ever since. Recently, Pennington (1990) made the combination *Sideroxylon thornei*; he gave convincing arguments (1991) that *Bumelia* should be considered congeneric with *Sideroxylon*.

Thorne's buckthorn was originally known from only a few counties in southwestern Georgia and was subsequently reported (Anderson 1988) nearby in Jackson County, Florida. Recent collections extend its known range into southeastern Georgia, extreme southeastern Alabama, and along the Apalachicola and Escambia rivers in Florida (Fig. 1). The following document the known range of *S. thornei* (sites identified only generally because of the species' rareness):

ALABAMA: Houston Co.: Big Creek, 15 May 1994, *J.R. McDonald* (FSU, TENN). **FLORIDA: Escambia Co.:** Escambia River, 16 Sep 1984, *J.R. Burkhalter 9597* (FSU). **Franklin Co.:** Apalachicola River, 17 Nov 1995, *L.C. Anderson 16114* (FSU); **Gulf Co.:** Apalachicola River, 17 Nov 1995, *L.C. Anderson 16107* (FSU), *L.C. Anderson 16108* (FSU),

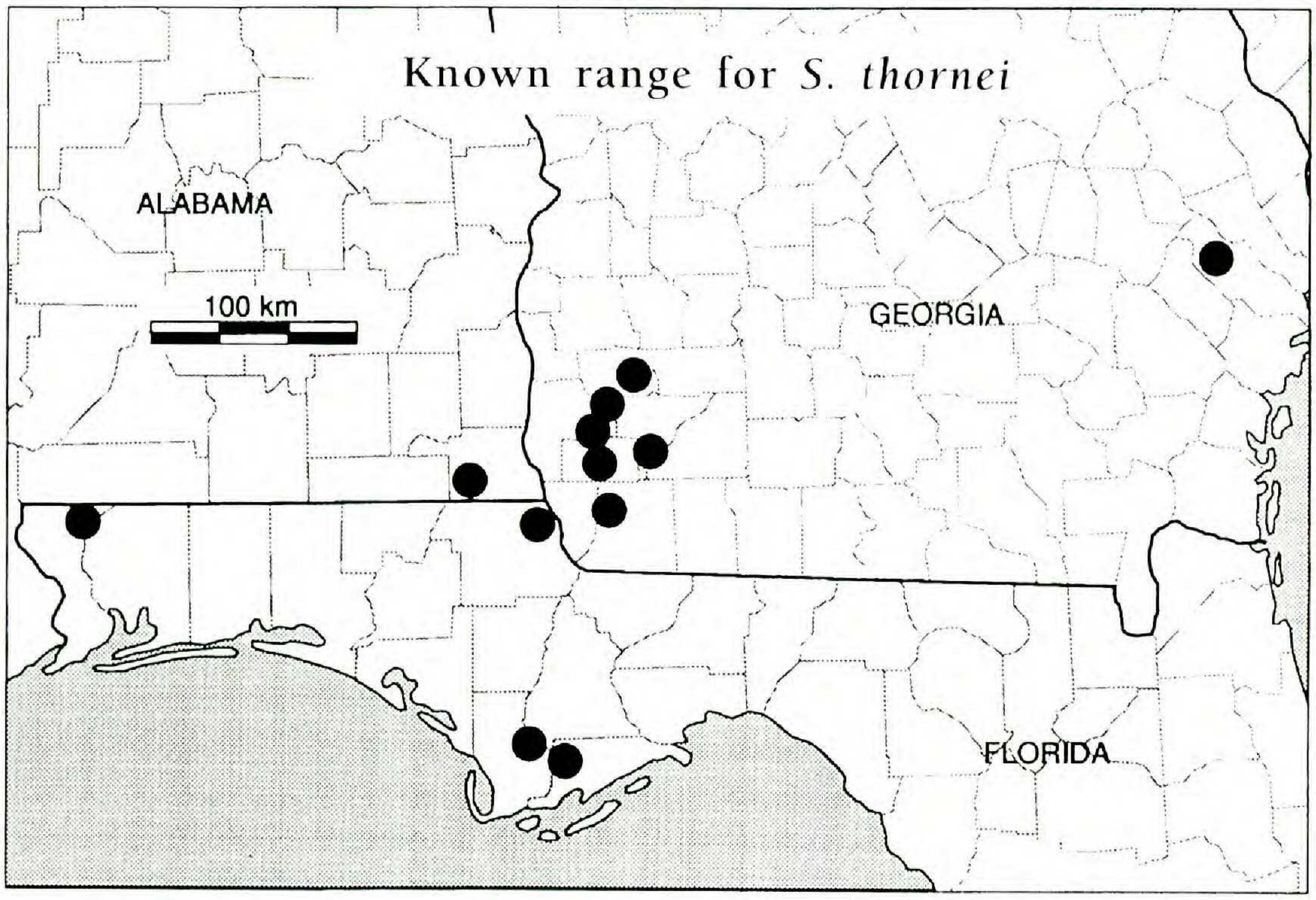


FIG. 1. Known range of *Sideroxylon thornei*.

Forbes Island, 17 Nov 1995, *L.C. Anderson 16111* (FSU), Apalachicola River, 2 Nov 1995, *H. Light & M. Darst s.n.* (FSU). **Jackson Co.:** N of Sneads, 15 Nov 1995, *L.C. Anderson 16082* (FSU); 11 Oct 1994, *K.C. Burks 991* (FSU); 16 Aug 1986, *A.K. Gholson 11720* (FLAS, FSU); 13 Jun 1988, *A.K. Gholson 11981* (FLAS); 1 May 1982, *R.K. Godfrey 79745* (FSU); 30 Jun 1987, *R.K. Godfrey 82429* (FLAS, FSU, MO); 30 Jun 1987, *R.K. Godfrey 82430* (FSU-several sheets); 27 Aug 1987, *R.K. Godfrey 82491* (FLAS, FSU-several sheets); 20 Oct 1987, *R.K. Godfrey 82601* (GA, FLAS, FSU); 13 Jun 1988, *R.K. Godfrey 82691* (GA, FLAS, FSU); 18 Oct 1990, *R.K. Godfrey 84015* (FSU, NY); N of Sneads, 19 Jun 1988, *R.B. McCartney s.n.* (GA); 13 Sep 1988, *R.B. McCartney s.n.* (FLAS). **GEORGIA: Baker Co.:** Flint River, 20 Oct 1995, *L.C. Anderson 15999* (FSU); limestone pond, 3 Jun 1940, *D. Eyles 7050* (GA); Flint River, 25 Aug 1993, *L.K. Kirkman 3105* (Ichauway Herb.). **Calhoun Co.:** Ichawaynochaway Creek, 23 May 1990, *J.R. Allison 4458* (GA). **Decatur Co.:** Spring Creek, 24 Oct 1990, *J.R. Allison 5058* (GA). **Early Co.:** E of Nantz Springs, 22 May 1990, *J.R. Allison 4446* (GA, MO); 31 Jul 1986, *A.K. Gholson 11701* (FSU); 14 Aug 1986, *A.K. Gholson 11713* (GA); 14 Aug 1986, *R.K. Godfrey 82063* (GA, FLAS, FSU-several sheets, MO); 1 Oct 1986, *R.K. Godfrey 82155* (FLAS, FSU-several sheets); 20 Oct 1992, *L.K. Kirkman 2704* (GA, Ichauway Herb.); 13 Sep 1988, *R.B. McCartney s.n.* (FLAS); 22 Oct 1947, *R.F. Thorne 7345* (GA-holotype, NY-isotype); Spring Creek, 24 Oct 1990, *J.R. Allison 5052* (GA). **Liberty Co.:** Cedar Bay, 19 Aug 1993, *M.O. Moore 1856* (GA). **Miller Co.:** Colquitt Swamp, 30 Aug 1990, *J.R. Allison 4715* (GA).

Reports of the species from Pierce, Tattnall, and Toombs counties in Georgia were based on misidentifications; the specimens were later identified as either *S. reclinatum* Michx. or the hybrid, *S. lanuginosum Michx.* × *S. reclinatum*.

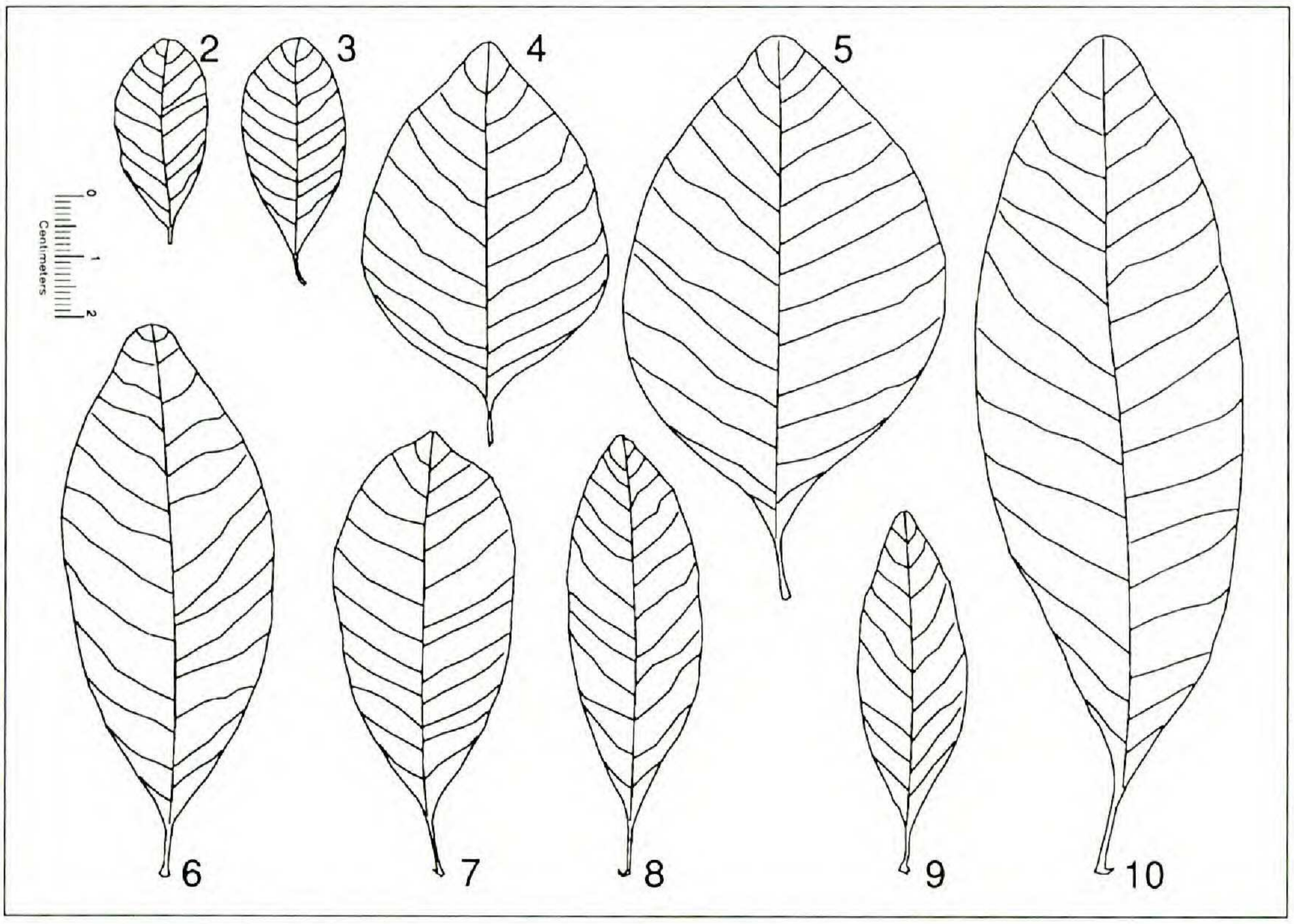
The original description (Cronquist 1949) said the species was a thorny

shrub about 1.5 m tall with mostly elliptic or elliptic oblanceolate leaves, 1.5–4 cm long and 6–20 mm wide. Godfrey's more detailed description (1988) noted the shrubs could reach 6 m in height and that leaves on a given shrub were variable in both size and shape. The variation in leaf size and shape is even greater than that recorded by Godfrey. Most leaves are oblanceolate to elliptic-oblong, but some are definitely ovate (up to 5.4 cm wide). Outlines of largest leaves from selected specimens demonstrate this variation in Figs. 2–10. The largest leaf on the holotype, *Thorne 7345*, was only 3.9 cm long (Fig. 2), whereas the largest leaf seen for the species (Fig. 10) was 13.9 cm long (*Kirkman 3105*). Part of the great size range in leaves results because some specimens were taken from the fast-growing primary canes and others from older stems that have numerous spur shoots with smaller leaves. Godfrey's population samples from the type locality show that those plants represented about 33% of the total variation found in the entire species' range in leaf size.

Cronquist (1949) noted that Thorne's buckthorn seemed to combine characteristics of *S. lanuginosum* and *S. reclinatum* and suggested it was probably of hybrid origin; that view was repeated by Pennington (1990). The key features for *S. thornei* (Godfrey 1988) include relatively glabrous stems as in *S. reclinatum* and hairy leaves more like those of *S. lanuginosum* but faintly reticulate-veined with the veins somewhat impressed (not bony cartilaginous as in *S. reclinatum*). The occurrence of larger leaves in many populations of *S. thornei* make it less similar to *S. reclinatum*.

Scanning electron microscopy of leaf surfaces was initiated to observe the dolabrate or malpighian hairs, but the form found associated with the stomata proved more interesting. All *Sideroxylon* species in the southeastern United States (seven to nine, depending on interpretation) have large stomatal rims that are raised funnel- or dome-like structures with long, narrow apertures that more or less hide the guard cells—somewhat like those illustrated for *Gordonia* (Anderson 1983). The stomatal density amongst *Sideroxylon* species appears to be inversely proportional to size of the stomatal apparatus; i.e., smaller stomates are more numerous per unit area than are larger ones (see Figs. 13 and 15).

Leaf surface micromorphology (Figs. 11–13) distinguishes *S. thornei* from all other taxa in the genus; samples from four different localities were scanned. The stomatal rims nearly cover the stomata; the rims are 14.9–17.2 μm long, and their apertures range from 0.9–1.3 μm wide. Numerous cuticular striae are aligned parallel to one another and generally at right angles to the long axes of the stomatal rims. Epidermal patterns for *S. lanuginosum* (Fig. 14), *S. reclinatum* (Fig. 16), and their putative hybrid (Fig. 15) have less pronounced stomatal rims with more open apertures, and the cuticular striae tend to encircle the rims. Stomatal rims in *S. lanuginosum*



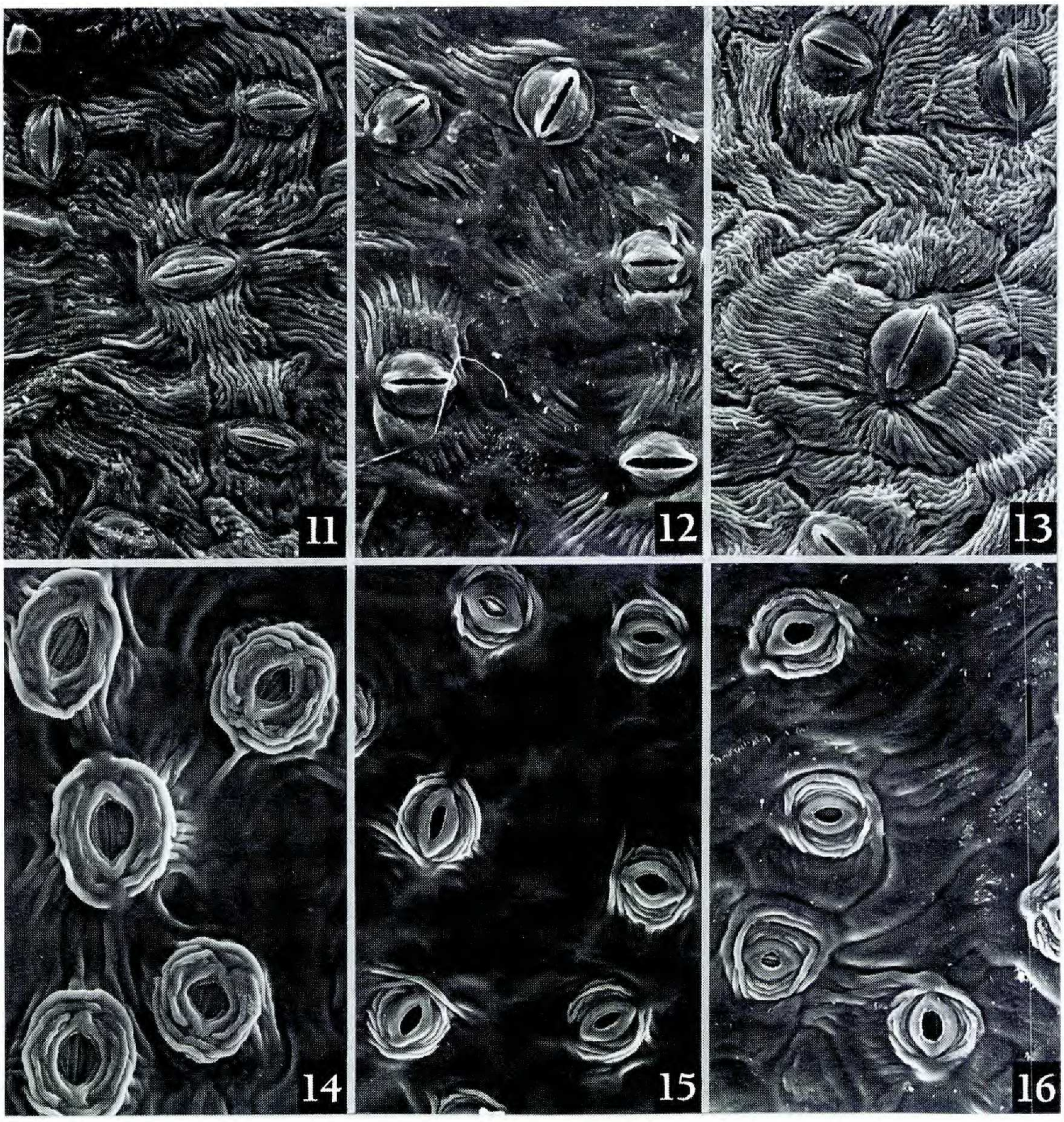
FIGS. 2–10. Largest leaf per *S. thornei* specimen to show variation in size and shape; all the same scale. Fig. 2. *Thorne 7345*, holotype. Fig. 3. *Thorne 7345*, isotype. Fig. 4. *Allison 4715*. Fig. 5. *Allison 5058*. Fig. 6. *Anderson 11607*. Fig. 7. *Anderson 11614*. Fig. 8. *Burkhalter 9596*. Fig. 9. *Moore 1856*. Fig. 10. *Kirkman 3105*.

range from 14.6–18.6 µm long, whereas they are shorter in *S. reclinatum* (12.7–13.1 µm). The surface pattern in the putative hybrid (Fig. 15) is intermediate between those of the presumed parents and supports the notion of its hybridity.

Clearly, on the basis of morphology of the stomatal complex, *S. thornei* is not derived from *S. lanuginosum* and *S. reclinatum* as some authors have suggested. The stomatal rims of *S. thornei* are most similar to those of *S. lycioides* L., but leaf surfaces of the latter have none of the cuticular striae that are so abundant in *S. thornei*.

Godfrey (1988) recorded fruit of Thorne's buckthorn as dull black, 8–10 mm long, and 8–10 mm wide, whereas fruit of *Light & Darst* (possibly more mature) was shiny black, slightly obovate, 12 mm long, and 11 mm wide.

Sideroxylon thornei is listed as endangered in Florida (Coile, 1993) and in Georgia (Patrick et al. 1995); it is a species of special concern in Alabama (Oberholster 1996). It appears to be a distinctive species in many ways. Known occurrences are still relatively few, and considerable habitat loss has been noted (Patrick et al. 1995). It deserves further field investigation of its distribution and threats and should be considered for Federal listing.



FIGS. 11–16. Scanning electron micrographs of abaxial leaf surfaces to show stomatal rims and cuticular patterns; all the same scale (scale bar in Fig. 16 = 10 μm). Figs. 11–13. *S. thornei*, note hidden stomata and similarity of cuticular relief. Fig. 11. *Godfrey 82063* (topotype). Fig. 12. *Anderson 16107*. Fig. 13. *Moore 1856*. Fig. 14. *S. lanuginosum*, *Anderson 9057*, note visible guard cells and numerous cuticular striae encircling the more open stomatal rims. Fig. 15. Hybrid of *S. lanuginosum* × *S. reclinatum*, *Anderson 4858*, with guard cells partially exposed and limited cuticular striae. The smaller stomatal complexes that are concomitantly more numerous per unit area may be related to hybridity. Fig. 16. *S. reclinatum*, *Godfrey 63520*, with partially open stomatal rims, cuticular striae, and minute flecks of epicuticular wax.

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